

# Joint Trauma System



## Catastrophic Non-Survivable Brain Injury

*Part of the Joint Trauma System (JTS) Clinical Practice Guideline (CPG) Training Series*



# Purpose



This CPG provides useful guidelines to manage casualties with catastrophic, non-survivable brain injury at Role 2 and Role 3 facilities.

*This presentation is based on the JTS Catastrophic Non-Survivable Brain Injury CPG, 27 Feb 2017 (ID:13). It is a high-level review. Please refer to the complete CPG for detailed instructions. Information contained in this presentation is only a guideline and not a substitute for clinical judgment.*

# Agenda



1. Summary
2. Background
3. Treatment
4. Resuscitation
5. Use of Blood Products
6. Transport
7. Performance Improvement (PI) Monitoring
8. References
9. Appendices
10. Contributors

# Summary



Patients identified as meeting criteria for catastrophic care receive all efforts dictated by protocol to keep them stable, in an effort to deliver them to the next level of care.

# Background

Catastrophic brain injury is defined as any brain injury that is expected after imaging evaluation and/or clinical exam to result in the permanent loss of all brain function above the brain stem level.



# Background



- Catastrophic brain injury is associated with profound physiologic changes:
  - ❑ Vascular regulatory disturbances
  - ❑ Widespread cellular injury
  - ❑ Alterations in metabolism, endocrine function, and immunology
  - ❑ Coagulopathy
- Approximately 60% of these patients have multiorgan system failure with cardiovascular collapse and asystole if not appropriately managed.

# Treatment



- Treatment focused on hemodynamic stabilization which consists of three aspects:
  1. Early identification of the severity of TBI as severity correlates with deficiencies in the pituitary adrenal axis.
  2. Intensive care management.
  3. Resuscitation with fluids and blood products with early use of vasopressors and endocrine/hormone therapy with refractory hemodynamic instability.

# Treatment



- Early identification and management of related complications are also required. These complications include:
  - ☐ Disseminated intravascular coagulation.
  - ☐ Diabetes Insipidus.
  - ☐ Neurogenic pulmonary edema.
  - ☐ Hypothermia.
  - ☐ Cardiac arrhythmias.
- Fluid resuscitate to target systolic blood pressure >100 mm Hg and CVP > 7
  - ☐ Norepinephrine initial pressor
  - ☐ If Diabetes Insipidus (DI), vasopressin drip along with DDAVP



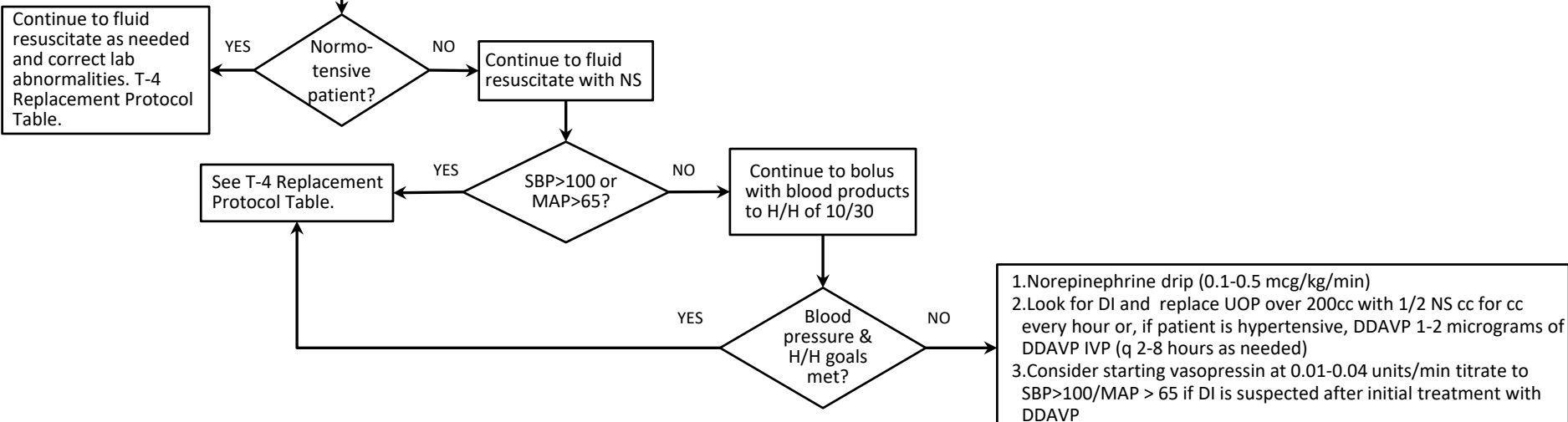
# Resuscitation

## Catastrophic brain injury resuscitation management for persistent hypotension

### Evaluate Patient in ER ASAP (follow ATLS guidelines)

1. Labs obtained: ABG/serum lactate/CBC/PT/PTT/ lytes head-injured patients
2. Transfuse to maintain Hct > 30
3. Bolus 1 liter NS or 500 ml 3% saline
4. Control active bleeding
5. Place large trauma central line
6. Transfer ASAP to ICU following CT scan

**Caution:** Patients may go from hypertension to hypotension rapidly



# T-4 Replacement Protocol



T-4 Replacement Protocol Table	
<b>Pretreatment</b>	
<ol style="list-style-type: none"><li>1. Fluid resuscitate to predefined endpoints (CVP &gt; 7, SBP &gt; 100)</li><li>2. Give blood to achieve an H&amp;H above 10 and 30</li><li>3. Correct electrolyte imbalances</li></ol>	
<b>Prerequisite</b>	
Patient is requiring a combined vasopressor need greater than 15 mcg (all VP added) to maintain a systolic pressure of 100 after the pre-treatment is completed or becomes hemodynamically unstable.	
<b>T-4 Protocol</b>	
<ol style="list-style-type: none"><li>1. Administer IV boluses of the following in rapid succession:<ul style="list-style-type: none"><li>▪ 1 Amp of 50% Dextrose</li><li>▪ 2 gm of Solumedrol</li><li>▪ 20 units regular insulin</li><li>▪ 20 mcg Thyroxin (T-4)</li><li>▪ Start a drip of 200 mcg T-4 in 500cc Normal Saline (0.4mcg/cc). Administer at 25cc (10mcg) per hour initially. Reduce levels of other vasopressors as much as possible &gt; 100 lbs give above dose</li><li>▪ 50-75 lbs. give 13cc = 5.2 mcg/hr</li><li>▪ 75-100 lbs. give 19cc = 7.6 mcg/hr</li></ul></li><li>2. After 30 to 60 minutes, patients may become tachycardic with an increase in temperature and blood pressure.</li><li>3. Monitor K+ levels carefully. The only perceived complication of T-4 identified to this point is an unusually high K+ requirement in some cases.</li></ol>	

# Treatment



- If after other treatments, more than one pressor required to maintain systolic blood pressure target or have evidence of DI, adjuncts addressing endocrine abnormalities should be considered.
  - Adjuncts include initial bolus of following:
    - 1 ampule 50% dextrose IV
    - 2 g Solumedrol IV
    - 20 units regular insulin IV
    - 20 µg of thyroid hormone (T4) IV, if available
  - Follow initial bolus by continuous infusion of 10 mcg/hr of T4 (if available).
- See appendices Management of Catastrophic Brain Injury and T-4 Replacement Protocol for details.

# Use of Blood Products



- Use of blood products should be done in the context of whether it is a limited resource.
- If blood available and the patient is responsive to interventions, blood products should be used to correct coagulopathy and significant anemia.
  - ❑ Goal hemoglobin: 10 g/dl
  - ❑ Goal INR: < 1.5
  - ❑ Goal Platelet Count: > 50,000

# Transport



Determine futility and the appropriateness of transport.

- If the patient is responsive to initial resuscitation efforts and achieves stability, transport to higher roles of care should be considered.
  - Re-unite service member with family at Role 4.
  - Consider organ donation.

# Transport



If the patient is not responsive to resuscitation efforts, then a combination of clinical judgement and operational considerations (further casualties, limited resources, etc.) should be used to determine extent of care

- Leadership should be involved early to determine availability of transportation and resources.
- If unable to transport or resources required elsewhere, withdrawal of support with dignity along with comfort care appropriate.

## ■ Intent (Expected Outcomes)

In patients identified as meeting criteria for catastrophic care, all efforts are undertaken by protocol to keep the patient hemodynamically stable in an effort to deliver them to the next level of care.

## ■ Performance/Adherence Measures

Early use of goal-directed fluid therapy, pressors, and hormone therapy in patients with catastrophic brain injury.

## ■ Data Sources

- ☐ Patient record
- ☐ DoD Trauma Registry

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# Appendices



- **Appendix A:** Catastrophic Brain Injury Resuscitation Management for Persistent Hypotension
- **Appendix B:** Management of Catastrophic Brain Injury
- **Appendix C:** T-4 Replacement Protocol
- **Appendix D:** Additional Information Regarding Off-Label Uses in CPGs

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